

WHAT IS CLAIMED IS:

1 1. A method of treating a slurry of comminuted cellulosic fibrous material to
2 produce a bleached chemical pulp, comprising:
3 (a) treating the material in a first stage with a gas containing ozone;
4 (b) treating the material in a second stage with a liquid containing chlorine dioxide;
5 (c) between (a) and (b) treating the material with an alkaline liquid to raise the pH of
6 the material prior to (b) and so that no washing is performed between (a) and (b).

1 2. A method as in claim 1 wherein (c) is practiced to raise the pH of the material to
2 at least about 6.0.

1 3. A method as in claim 1 further comprising (d), prior to (a), treating the material in
2 an alkaline chemical pulping process, to produce chemical pulp.

1 4. A method as in claim 3 wherein (d) is practiced using an essentially sulfur-free
2 pulping process.

1 5. A method as in claim 4 wherein (d) is practiced using an alkaline chemical
2 pulping process that includes treatment with a strength or yield enhancing additive.

1 6. A method as in claim 5, wherein (d) is further practiced using an alkaline
2 chemical pulping process includes a bulk delignification stage, and at least one stage prior
3 to or during bulk delignification stage in which a liquid containing a first level of dissolved
4 organic material is removed from the material and replaced with a second liquid having an
5 at least about 50% lower level of dissolved organic material.

1 7. A method as in claim 1 wherein (a) is preceded by (a1) treating the material with
2 a liquid containing chlorine dioxide, followed by (a2) treating the material with an alkaline
3 liquid.

1 8. A method as in claim 7 wherein (a2) includes a treatment with oxygen, a
2 peroxide, or both.

1 9. A method as recited in claim 4 wherein (d) is practiced using a soda pulping
2 process.

1 10. A method as recited in claim 4 wherein (d) is practiced using a soda/AQ pulping
2 process.

1 11. A method as recited in claim 10 wherein (c) is practiced to raise the pH of the
2 material to at least about 7.0

1 12. A method as recited in claim 2 further comprising (d), prior to (a), treating the
2 material in an alkaline chemical pulping process that includes anthraquinone, polysulfide,
3 or their equivalents or derivatives.

1 13. A method as in claim 2 wherein (a) is preceded by (a1) treating the material
2 with a liquid containing chlorine dioxide, followed by (a2) treating the material with an
3 alkaline liquid.

1 14. A method as in claim 13 further comprising (d), prior to (a), treating the material
2 in an alkaline chemical pulping process, to produce chemical pulp.

1 15. A method as recited in claim 14 wherein (d) is practiced using a soda/AQ
2 pulping process.

1 16. A method as in claim 15, wherein (d) is further practiced using an alkaline
2 chemical pulping process includes a bulk delignification stage, and at least one stage prior
3 to or during bulk delignification stage in which a liquid containing a first level of dissolved
4 organic material is removed from the material and replaced with a second liquid having an
5 at least 50% lower level of dissolved organic material.

1 17. A method for producing bleached chemical pulp from comminuted cellulosic
2 fibrous material comprising:
3 (a) treating the material in a chemical pulping process in the presence of chemical
4 additive to produce a chemical pulp containing at least some of the additive;

5 (b) treating the chemical pulp with at least one elemental-chlorine-free bleaching
6 agent to produce a bleached chemical pulp having at least some discoloration due to the
7 presence of the chemical additive; and

8 (c) treating the bleached pulp with at least one oxidizing agent to remove the
9 discoloration produced by the presence of the chemical additive.

1 18. A method as in claim 17 wherein (a) is practiced using anthraquinone or its
2 equivalents or derivatives as the chemical additive used in the pulping process.

1 19. A method as in claim 17 wherein (b) is practiced using as the at least one
2 bleaching agent one or more of the following bleaching agents: oxygen, chlorine dioxide,
3 sodium hydroxide, ozone, and hydrogen peroxide.

1 20. A method as in claim 17 wherein (b) is practiced so that the discoloration is
2 characterized by a yellow or orange tinge to the pulp.

1 21. A method as in claim 17 wherein (c) is practiced using as the oxidizing agent at
2 least one of air, oxygen, peroxide, or ozone.

1 22. A method as in claim 18 wherein (c) is practiced using as the oxidizing agent a
2 gas containing ozone; and wherein (a) is a soda/AQ pulping process; and wherein (b) is
3 practiced using as the at least one bleaching agent one or more of the following bleaching
4 agents: oxygen, chlorine dioxide, sodium hydroxide, ozone, and hydrogen peroxide.

1 23. A method of ECF treatment of comminuted cellulosic fibrous material
2 comprising the sequence soda/AQ cooking, and then one of D-E_p-(ZEND), or D-E_o-
3 (ZEND), or D-E_{op}-(ZEND).

1 24. A method as in claim 23 wherein the treatment is practiced to produce pulp with
2 a brightness over 89% ISO.

1 25. Pulp produced according to claim 24, having a viscosity of over 21 cP.